

2. *Lingula smaragdina*, A. Adams.

L. testa oblonga, lateribus rectiusculis, ad umbones attenuata, ad marginem ventralem subtruncata; carina dorsali valida, prominente; glabra, nitente, viridissima.

Hab. Yobuko; 10 fathoms, mud.

A bright green species, found also in the China Sea, and most nearly resembling *L. hirundo*, Reeve.

3. *Lingula jaspidea*, A. Adams.

L. testa oblongo-ovali, lateribus convexis, ad umbones subdilatata; margine ventrali arcuato; carina dorsali mediocri, subdepressa; glabra, nitente, subviridi-lutescente, antice pallidiore, rufo-fusco tincta.

Hab. Mososeki; 7 fathoms, mud.

4. *Lingula lepidula*, A. Adams.

L. testa oblongo-ovali, umbonibus acutis, productis, lateribus convexis, dilatatis, membranaceis; margine ventrali rotundato; carina dorsali depressa; glabra, nitente, luteo-cornea, in medio albida.

Hab. Seto-Uchi (Akasi); 10 fathoms, mud.

A species as small as *L. semen*, and shaped like *L. ovalis*.

XV.—*A Contribution to the Knowledge of the Tæniæ.*

By LUDWIG STIEDA*.

OF the numerous Cestodea forming the group of the *Tænioidea*, scarcely any except the cystic *Tæniæ* have hitherto been particularly investigated in respect to the generative organs, the other *Tæniæ* having received little attention. The different forms, however, as has already been shown by Pagenstecher's description of the several organs of *Tænia microsoma*†, present very peculiar structures, differing in many parts from the arrangement of the sexual organs occurring in the cystic *Tæniæ*; and these are of more importance inasmuch as the different structure of the generative organs will enable us to found a more certain and natural classification of the innumerable *Tænioidea* than has hitherto been possible. For this reason I hope that the present short communication, in which I have endeavoured to describe the generative organs of certain *Tæniæ*, some of them unknown, others imperfectly known, will not be entirely destitute of interest.

In the small intestine of the Field-Mouse (*Hypudæus arvalis*)

* Translated by W. S. Dallas, F.L.S., from Wiegmann's Archiv, 1862, p. 200.

† Zeitschr. für wiss. Zool. ix. p. 523.

there is frequently a Tapeworm of considerable size, which, according to the character given by Dujardin* with especial reference to the habitat, I must regard as the *Tænia omphalodes*, Hermann.

This *Tænia* is 120–160 mill. in length; the head is quadrangular, measures 1·5–2·5 mill., and is distinctly separated from the body of the Tapeworm; it possesses neither a proboscis nor a circlet of hooks, but only four round sucking-disks, 0·35 mill. in diameter. The so-called neck, on which no joints are perceived, even by the microscope, is 1·5–2·5 mill. in length, and 1 mill. in breadth. The succeeding, distinctly recognizable joints increase rapidly in breadth, so that at a distance of 25–35 mill. from the head the joints are already 4–5 mill. broad. The joints do not, however, maintain this breadth, but diminish in the lowest part of the worm to 3 mill. The length of the joints increases very gradually, but constantly; the broadest joints are $\frac{1}{2}$ –1 mill. in length, so that they are about five times as broad as long; the last joints are about 2 mill. in length. In consequence of this shortness of the joints, the Tapeworm, in its upper parts, has a very finely striated appearance, whilst it is only in the lower parts that, as the joints become longer, the notched form more or less peculiar to the Tapeworms in general manifests itself. The sexual orifices do not occur always upon the same side, but, in irregular sections, sometimes on one and sometimes on the other side. The number of joints forming the Tapeworm may be ascertained to be 250–300 by direct counting, which must be effected, on the parts nearest to the head, by means of the microscope. A perfectly developed uterus, with distinctly recognizable ova, is exhibited by the first joints of the third hundred; fully developed embryos occur about twenty-five joints further on.

In the 40–50 joints lying nearest to the head no development of sexual organs can be recognized, but in the part of each joint in which the sexual organs are to be produced there is a greater accumulation of cells. This becomes gradually differentiated in this way:—a rounded mass, from which the female germ-preparing organs are developed, becomes marked off in the middle line of the joint, on the one side from a mass situated on the lateral margin of the joint, and destined to produce the testes, and on the other from a small elongated mass of cells deposited on the opposite margin of the joint, and which serves for the development of the germiducal organs.

In the following joints (40–80), which increase chiefly in breadth, the testes are first of all developed. From the mass which is situated on the side opposite to the genital pore a large

* Hist. Nat. des Helminthes, p. 578.

group of small roundish corpuscles, measuring 0·035–0·056 mill., is formed; these, gradually increasing in size and number, soon occupy one-half of the joint. These corpuscles appear at first finely granular, afterwards pale and transparent, and represent the well-known testicular vesicles or testicular tubes of the *Tæniæ*. Transverse sections show that these testicular vesicles are enclosed by a fine structureless membrane, and still contain in the interior a cellular mass, whilst the fine, delicate, very long seminal filaments already occur rolled up at the margin. Sometimes a fine efferent duct may be detected on these corpuscles. At the same time, on the side of the joint opposite to the testis, an elongated vesicle is formed from the aggregation of cells there occurring; this is 0·210 mill. in length, and 0·070 mill. in breadth at its widest part. This is the cirrus-pouch, which is somewhat pointed at the extremity turned towards the median line of the joint, and applies itself with the other (rounded) end to the genital pore. It contains the penis or lemniscus, which is 0·056 mill. in length, and 0·014 mill. in breadth. This is continued into the vas deferens, which disappears behind the cirrus-pouch, without forming any loops. In favourable transverse sections, however, it may be traced beyond the median line of the joint. I have never seen any connexion between it and the above-described fine efferent ducts of the testes.

In the following joints (80–100), whilst the testicular vesicles and cirrus-pouch still further increase in size, the female organs also make their appearance. While previously there was only an indistinctly limited organ of undefined appearance between the testes and cirrus-pouch, we may now distinguish two organs distinctly separated from each other in form and contents. At the lower margin of each joint there is an elliptical body, with its longest axis placed in the transverse diameter of the joint; this is the germ-stock, which measures 0·0280–0·0350 mill. in length, and 0·210 mill. in breadth, and appears to be filled with finely granular contents. Below, the germ-stock is pretty sharply defined; but above, its limits are not so distinctly marked, because the yolk-stocks are situated upon it. The latter occupy the space between the germ-stock and the upper margin of the joint, spreading out right and left; they appear as if composed of a number of larger and smaller cæca, which seem to unite at the median line of the joint. Their contents (as may be seen by tearing them to pieces, and still more distinctly in transverse sections) are coarsely granular, consisting of a quantity of very small, homogeneous, strongly refractive corpuscles. At the lower margin of the cirrus-pouch there is a more or less distinctly projecting canal, which is somewhat dilated at its orifice in the genital pore. This canal, which is 0·021 mill. in diameter at its

orifice, but subsequently only 0·007–0·014 mill., represents the vagina. Close behind the end of the cirrus-pouch which is turned towards the median line of the joint, this canal becomes suddenly dilated to the considerable size of 0·070 mill.: the limits of this dilatation escape detection in the vicinity of the germ-stock and yelk-stock; so that it would appear as if the dilatation pushed itself in between those organs. I have not been able to discover any connexion between the dilatation of the vaginal canal and the germ-producing organs. The contents of this dilatation consist, as may easily be ascertained, of seminal filaments; so that we have to do, according to this, only with a remarkably extended seminal pouch of the vagina, or a *receptaculum seminis*.

Whilst now the *receptaculum seminis* becomes more and more filled by increased reception of semen, and the germ-stock and yelk-stocks become more and more extended, the testes undergo a retrograde metamorphosis, and gradually disappear.

At about the 150th joint the first indication of the uterus makes its appearance. Both at the upper margin and at the two lateral margins the uterus appears as a cavity in the parenchyma of the body, furnished with diverticula and filled with a mass resembling the contents of the yelk-stocks. The following joints present the different degrees of development of the uterus, whilst the other organs gradually disappear. Towards the end of the second hundred segments, in which the uterus is shown in its full development, of the other organs only the cirrus-pouch and vaginal canal, with the *receptaculum seminis*, are retained; the latter organs are completely pressed down to the lower margin of the joint, and have considerably diminished in extent. The form of the uterus is characteristic, in that its principal stem, corresponding with the short but broad form of the proglottides, runs transversely, whilst the lateral branches or the individual diverticula are arranged in the direction of the length of the joint.

As the development of the ova was not sufficiently observed by me, I only add a few words upon the mature ova found in the last proglottides. These appear smooth and perfectly round; they are 0·035–0·042 mill. in diameter, and possess two envelopes, of which the outer one, 0·0035 mill. in thickness, presents a stratified appearance, whilst the other, which is closely applied to the embryo, on which the embryonal hooks are scarcely visible, appears to be very fine and structureless.

In the small intestines of the Field-Mouse there was sometimes, although but rarely, another *Tænia*, to which I here refer because it perfectly agrees, in regard to the genital apparatus, with the *T. omphalodes*. I am not in a position to make very

accurate statements as to the length and size of this *Tænia*, as the examples of it which I have seen were never quite perfect, and, especially, never possessed maturely developed proglottides. I mention only that this Tapeworm exactly resembles the *T. omphalodes* in regard to its head and upper part, although it is of rather smaller dimensions; in the lower part, however, it differs in that the joints, as they grow narrower, become considerably elongated, so that the last joints are three times as long as broad, and appear somewhat compressed laterally. I regard this Tapeworm as identical with the *Tænia pusilla*, Goeze, which, indeed, has hitherto only been mentioned as occurring in the common mice and rats, but the description of which suits very well with the present Tapeworm.

In the small intestine of the Shrew (*Sorex araneus*) I have met with two Tapeworms distinctly differing from each other both in size and in the form of the hooks, which, however, do not agree with the characters given by Dujardin* of some *Tæniæ* found by him in the Shrews. I regard them, therefore, as hitherto unknown forms.

One of these two *Tæniæ*, which occurs very frequently, numbering from ten to twenty in each Shrew, and which I will denominate *T. uncinata*, is 10–15 mill. in length. The head is 0·280 mill. in breadth, has four sucking-disks 0·056 mill. in diameter, and a short proboscis, which has a simple cirlet consisting of fourteen to eighteen hooks. The head passes immediately into the neck, which is but little narrower, and exhibits no segmentation. The number of recognizable joints is about 120. The joints immediately following the neck are 0·182 mill. in breadth; and as they advance they increase both in length and breadth, so that the last joints are about 0·560 mill. broad and 0·210 mill. long. The sexual orifices all occur upon one side of the worm, each in the middle of the joint. The hooks have a very characteristic form; they are very strongly curved, and have a rather fine point. The extreme point of the hook is distant from the extremity of the root-process 0·0175 mill., and from that of the dental process only 0·0035 mill.; the two processes are 0·0140 mill. apart.

The various stages of development of the sexual organs as presented in the different joints are not so easy to observe in this Tapeworm as in *T. omphalodes*. It appears only that in this case also the development commences especially at three points in each joint. One of these points is at the upper margin of each joint, where the cirrus-pouch and vagina are formed, whilst the germ-preparing organs are produced from two aggregations of cells situated in the middle of the joint.

* Hist. Nat. des Helminthes, p. 562.

In a sexually mature segment the most striking organ is one situated in the middle, which may be compared, as to its form, with a retort. The neck of this, which is turned towards the margin of the joint, opens into the genital pore, whilst the body of the retort almost touches the lower margin of the joint, and is surrounded here by two other organs. The diameter of the tube at its external orifice is 0·0070 mill., and enlarges to 0·0105 mill.; the diameter of the body is 0·035–0·052 mill. Its contents consist, as may easily be ascertained, of seminal filaments. Below or above the tube, and often completely concealed by it, there is a small vesicle, 0·042 mill. in length and 0·0105 mill. in breadth, pointed at both ends, which issues above the orifice of the tube in the genital pore. This is the cirrus-pouch, which contains the small, rarely protruded penis: posteriorly the penis passes into the *vas deferens*, which here also exhibits no loops, but disappears under the retort-like organ. This retort-like organ occurs also, although not constantly, of the same extent and form in other Tapeworms, and was not unknown to previous observers, but has usually received an erroneous signification. By Dujardin, as appears from his descriptions and figures of the Tapeworms of the Shrews observed by him (*Tænia pistillum*, *T. tiara*, *T. scalaris*, and *T. murina**), it was regarded as the testis opening into the cirrus-pouch—an opinion which has also been expressed very recently by Weiland† with regard to the same organ in *Tænia flavopunctata*. On the other hand, Professor Leuckart, as I learn from his own communication, long since recognized the corresponding organ in *Tænia nana* as the vaginal canal, with a very greatly dilated *receptaculum seminis*. From the description above given, no further discussion is necessary as to whether here in *Tænia uncinata* we are to recognize in this organ the vagina and the seminal receptacle formed out of it which particularly distinguish this group from that of the cystic *Tæniæ*. On the portion of the receptacle approximated to the lower margin of the segment lies the elliptical germ-stock, filled with finely granular contents, and measuring 0·025 mill. in length and 0·014 mill. in breadth, and on each side the apparently coarsely granular yelk-stocks. I could find no connexion between the germ-stock, yelk-stocks, and *receptaculum seminis*. The remainder of the joint is occupied by from three to five pale transparent testicular vesicles, which are of a round form and 0·035 mill. in diameter. In the segments presenting the next grades of development all the organs, except the cirrus-pouch and the *receptaculum seminis*, which has a distinct canaliform process to the lower margin of

* Helminthes, pp. 562 *et seq.*

† Beschreibung zweier neuer Tænioiden des Menschen: Jena, 1861, p.9.

the joint, have disappeared; on the other hand, the uterus, with its ova, immediately makes its appearance. In this case, however, it does not present, as in other *Tenia*, the characteristic form, already often compared to a stem and branches, but only forms a sac densely filled with ova, and occupying the whole joint. Each joint contains about 100–150 eggs. The fully developed ova are elliptical, 0·0560 mill. in length and 0·0455 mill. broad; they present three envelopes, of which the outermost is smooth and transparent, the intermediate one very thin and slightly folded, and the innermost one, which is closely applied to the embryo, 0·0035 mill. in thickness. The diameter of the six-hooked embryo is 0·0315 mill.; the distinctly perceptible embryonal hooks are 0·0105 mill. in length.

The second *Tenia* met with in the Shrew, which I will call *T. furcata*, on account of the forked form of its hooks, is very rare. Its length is 8–10 mill.; the round head, distinctly separated from the neck, is 0·151 mill. in breadth, and possesses four sucking-disks and a short proboscis, which is furnished with a circlet of from twenty-two to twenty-eight hooks. The neck is 0·210 mill. in breadth. The width of the segments increases gradually with the length, so that the broadest segments are 0·56 mill. in breadth and 0·21 mill. in length: the last joints, from which the ova are already removed, exhibit smaller dimensions; they are 0·280 mill. broad, and 0·105 mill. long. The number of distinctly recognizable segments is 100. The genital orifices are all on one side.

The hooks are distinguished by a long and thin root-process, which is clearly separated from the true hook-process. The distance from the root-process to the apex of the hook is 0·024 mill.; the apex of the hook is distant 0·005 mill. from the distal process, and the two processes are 0·0210 mill. apart.

With regard to the sexual organs and the ova, I have nothing to add, as all that has been said of *T. uncinata* applies also to this *Tenia*.

XVI.—Remarks on some Coal-measure Crustacea belonging to the Genus *Belinurus*, König; with Description of two new Species from Queen's County, Ireland. By WILLIAM HELLIER BAILY, F.G.S.*

[Plate V.]

THE generic term *Belinurus* was applied by König, in 1820, to a peculiar Crustacean from the Coal-measures, figured and named

* An abstract of this paper was read at the Meeting of the British Association in 1858.